Complete Summary

GUIDELINE TITLE

Diabetic ketoacidosis.

BIBLIOGRAPHIC SOURCE(S)

Diabetic ketoacidosis. Philadelphia (PA): Intracorp; 2005. Various p. [14 references]

GUIDELINE STATUS

This is the current release of the guideline.

All Intracorp guidelines are reviewed annually and updated as necessary, but no less frequently than every 2 years. This guideline is effective from July 1, 2005 to July 1, 2007.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Diabetic ketoacidosis

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Endocrinology
Family Practice
Internal Medicine
Pediatrics

INTENDED USERS

Allied Health Personnel
Health Care Providers
Health Plans
Hospitals
Managed Care Organizations
Utilization Management

GUIDELINE OBJECTIVE(S)

To present recommendations for the diagnosis, management, and treatment of diabetic ketoacidosis that will assist medical management leaders to make appropriate benefit coverage determinations

TARGET POPULATION

Individuals with diabetic ketoacidosis

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis/Evaluation

1. Physical examination and assessment of signs and symptoms
2. Diagnostic tests
    - Laboratory tests including glucose level; ketones in blood and urine specimens; blood urea nitrogen (BUN) and creatinine; serum levels of sodium, potassium, chloride, and phosphorus; white blood cell (WBC) count; arterial blood gas (ABG)
    - Chest x-ray
    - Electrocardiogram (ECG)
    - Abdominal computerized tomography (CT) scan or ultrasound (US)
    - Lumbar puncture, if necessary

Management/Treatment

1. Intravenous isotonic fluids
2. Continuous intravenous insulin
3. Measuring and correcting serum magnesium, potassium, and phosphorus levels
4. Monitoring metabolic state with serial measurements of chemistry and blood gas pH
5. Adding glucose to intravenous fluid when ketoacidosis is reversed
6. Changing insulin administration to a subcutaneous regimen
7. Referral to specialists

MAJOR OUTCOMES CONSIDERED

Not stated

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Searches were performed of the following resources: reviews by independent medical technology assessment vendors (such as the Cochrane Library, HAYES); PubMed; MD Consult; the Centers for Disease Control and Prevention (CDC); the U.S. Food and Drug Administration (FDA); professional society position statements and recommended guidelines; peer reviewed medical and technology publications and journals; medical journals by specialty; National Library of Medicine; Agency for Healthcare Research and Quality; Centers for Medicare and Medicaid Services; and Federal and State Jurisdictional mandates.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

A draft Clinical Resource Tool (CRT or guideline) is prepared by a primary researcher and presented to the Medical Technology Assessment Committee or the Intracorp Guideline Quality Committee, dependent upon guideline product type.

The Medical Technology Assessment Committee is the governing body for the assessment of emerging and evolving technology. This Committee is comprised of a Medical Technology Assessment Medical Director, the Benefit and Coverage Medical Director, CIGNA Pharmacy, physicians from across the enterprise, the Clinical Resource Unit staff, Legal Department, Operations, and Quality. The Intracorp Guideline Quality Committee is similarly staffed by Senior and Associate Disability Medical Directors.

Revisions are suggested and considered. A vote is taken for acceptance or denial of the CRT.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Comparison with Guidelines from Other Groups
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Diagnostic Confirmation

Subjective Findings

- The clinical presentation of diabetic ketoacidosis (DKA) is usually subacute, with patients presenting with 12 to 36 hours of the following symptoms:
    - Weakness
    - Report of changes in "input and output"
        - Polyuria

        - Polydipsia
- As DKA progresses, the following symptoms may be present
    - Deep and rapid breathing (Kussmaul respirations)
    - Blurry vision
    - Abdominal pain, nausea, and vomiting
    - Dehydration; dry mouth, dizziness
    - Confusion, usually in those with severe hyperglycemia
    - Infection (fever may be masked in DKA)

Objective Findings

- Dehydration
- Acidosis
- Tachycardia
- Orthostatic hypotension
- Dry mucous membranes
- Fever, which may be masked despite advanced infection
- "Fruity" breath odor due to acetone
- Altered mental status, mild confusion, or frank lethargy
- Cellulitis and infected lower extremity ulcers
- Abdominal findings may be similar to appendicitis or cholecystitis (e.g., abdominal tenderness)
- A clinical picture consistent with shock (less common finding)

Diagnostic Tests

- Initial laboratory values usually indicate the following:
    - Hyperglycemia
    - Anion gap acidosis
    - Elevated ketones in blood and urine specimens
    - Signs of volume depletion
        - Elevated blood urea nitrogen (BUN) and creatinine
        - Changes in serum levels of sodium [Na], potassium [K], chloride (Cl) and phosphorus (P)
    - Elevated white blood cell [WBC] count
    - Abnormal arterial blood gas [ABG] analyses
- Chest x-ray, urinalysis, and electrocardiogram (ECG) are required and may help delineate an otherwise occult cause of DKA.
- Abdominal computerized tomography (CT) scan or ultrasound (US) may be needed to evaluate abdominal pain.
- In patients with signs of possible meningitis, a lumbar puncture may be necessary.

Differential Diagnosis

- Hypoglycemia
- Hyperglycemia, especially in type II diabetes
- Hyperglycemic hyperosmolar nonketotic coma (HHNC or HHNK)
- Myocardial infarction
- Abdominal emergencies (e.g., mesenteric ischemia, cholecystitis, appendicitis)
- Central nervous system (CNS) infections

- Bacteremia from any cause may present primarily as DKA

Treatment

Treatment Options

- The treatment of DKA revolves around the administration of insulin, fluid and electrolyte repletion, and treatment of the underlying cause.
- Severe acidosis, respiratory decompensation, and significant hypotension unresponsive to fluids may all warrant transfer to an intensive care unit setting.
- The treatment of diabetic ketoacidosis begins with intravenous isotonic fluids. Most patients demonstrate 10% volume depletion equivalent to a deficit of 5 to 7 liters. In addition, continuous intravenous insulin is required. Serum magnesium (Mg), K, and P are measured and corrected. Typically, the serum K and Mg are low and require supplementation once urine output is documented.
- The metabolic state is monitored with serial measurements of chemistry and blood gas pH every 2 to 4 hours. When the ketoacidosis is reversed (as determined by bicarbonate greater than 19 mEq/L) and the serum glucose is 250 to 300 mg/dL, glucose is added to the intravenous fluids.
- Following reversal of the acidotic state, the patient can be fed oral liquids. If tolerated, the diet is progressively advanced to solid food. At the same time, insulin administration can be changed to a subcutaneous insulin regimen. Upon discharge to home, final adjustments to the insulin schedule are made.

Duration of Medical Treatment

- Medical - Optimal: 1 day(s), Maximal: 35 day(s)

Additional provider information regarding primary care visit schedules, referral options, frequency and duration of specialty care, and durable medical equipment are provided in the original guideline document.

The original guideline document also provides a list of red flags that may affect disability duration, and return to work goals, including

- Resolving insulin regimen
- After hospitalization

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate diagnosis, management, and treatment of diabetic ketoacidosis that assist medical management leaders to make appropriate benefit coverage determinations

POTENTIAL HARMS

Not stated

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Diabetic ketoacidosis. Philadelphia (PA): Intracorp; 2005. Various p. [14 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2005

GUIDELINE DEVELOPER(S)

Intracorp - Public For Profit Organization

SOURCE(S) OF FUNDING

Intracorp

GUIDELINE COMMITTEE

CIGNA Clinical Resources Unit (CRU)
Intracorp Disability Clinical Advisory Team (DCAT)
Medical Technology Assessment Committee (MTAC)
Intracorp Guideline Quality Committee

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Not stated

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

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Reprints of complete guideline content may be purchased for $35.00 per title (plus tax in TX at 8.25% and CT at 1.0%). Please send e-mail request to lbowman@mail.intracorp.com.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Policies and procedures. Medical Technology Assessment Committee Review Process. Philadelphia (PA): Intracorp; 2004. 4 p.
- Online guideline user trial. Register for Claims Toolbox access at www.intracorp.com.

Licensing information and pricing: Available from Intracorp, 1601 Chestnut Street, TL-09C, Philadelphia, PA 19192; e-mail: lbowman@mail.intracorp.com.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on August 10, 2005. The information was verified by the guideline developer on August 31, 2005.

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Date Modified: 9/25/2006